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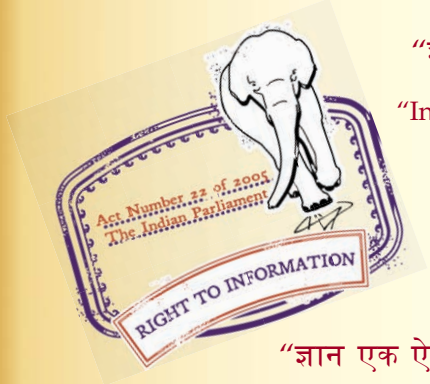
IS 10811 (1984): Oxygen and acetylene manifold regulators for welding, cutting and related processes [MTD 11: Welding General]



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"Knowledge is such a treasure which cannot be stolen"

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IS : 10811 - 1984
(Reaffirmed 2006)

Indian Standard

SPECIFICATION FOR OXYGEN AND ACETYLENE MANIFOLD REGULATORS FOR WELDING, CUTTING AND RELATED PROCESSES

UDC 621·791·5·03 : 621·646·4

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4

August 1984

Indian Standard

SPECIFICATION FOR OXYGEN AND ACETYLENE MANIFOLD REGULATORS FOR WELDING, CUTTING AND RELATED PROCESSES

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(*Continued on page* 13)

Indian Standard

SPECIFICATION FOR OXYGEN AND ACETYLENE MANIFOLD REGULATORS FOR WELDING, CUTTING AND RELATED PROCESSES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 2 January 1984, after the draft finalized by the Welding General Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 Pressure regulators for gas cylinders used for welding, cutting and allied processes have been covered in IS : 6901-1981*. This standard specifies requirements for regulators used in manifold systems.

0.3 In preparing the standard, assistance has been derived from ISO/TC 44/SC 8 N311 (DP 7291) 'Manifold regulators for welding, cutting and related processes — Definitions, requirements and testing', issued by the International Organization for Standardization (ISO).

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard covers oxygen and acetylene manifold regulators for welding, cutting and related processes. The regulators are meant for fitting at the ends of high pressure line (manifold) in cylinder batteries for providing central supply of compressed and dissolved gases. This standard does not apply to pressure regulators designed for direct connection to gas cylinders.

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*Pressure regulators for gas cylinders used in welding, cutting and related processes (*first revision*).

†Rules for rounding off numerical values (*revised*).

2. TERMINOLOGY

2.1 Manifold Regulator — A manifold regulator (referred to as a pressure regulator in this standard) is a device for reducing a generally variable inlet pressure to as constant as possible outlet pressure, even if the discharge varies (*see* Fig. 1).

3. DESIGN AND CONSTRUCTION REQUIREMENTS

3.1 Material

3.1.1 The material of the regulator components liable to come into contact with the gases shall have adequate resistance to the chemical action of the gases under operating conditions.

3.1.2 The maximum content of the copper in the material for the manufacture of acetylene regulator coming directly in contact with acetylene shall be limited to 70 percent. The materials used for parts in acetylene regulators and coming in contact with acetylene shall be proof against acetone conforming to IS : 170-1966*.

3.1.3 Material subject to rusting shall not be used for parts in contact with oxygen.

3.2 Design, Machining and Assembly

3.2.1 *Oxygen Regulators* — Regulators for oxygen shall be so designed, machined and assembled as to avoid internal ignition; all components and accessories shall be thoroughly cleaned and degreased before assembly.

NOTE — Although this clause has been specially specified for oxygen regulators in the interest of safety it may be desirable to follow this provision for all gas regulators.

3.2.2 *Filter* — A dust filter having an effective cross section compatible with the discharge of the regulator shall be mounted within the regulator upstream of the pressure regulating valve.

3.2.3 *Inlet Pressure Connection* — The choice of the regulator connection to the high pressure line is at the discretion of the manufacturer.

The inlet connection of the regulator for special type of gas shall be designed to prevent connection to cylinders for other types of gases.

3.2.4 *Outlet Pressure Connection* — The choice of the outlet pressure connection is at the discretion of the manufacturer.

*Specification for acetone (*first revision*).

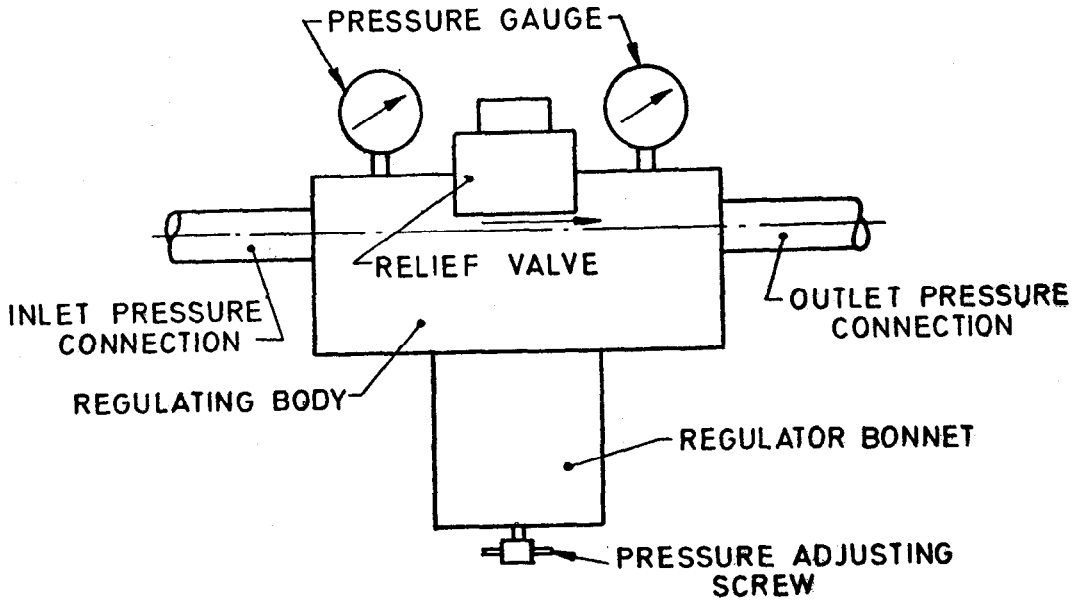


FIG. 1 MANIFOLD PRESSURE REGULATOR

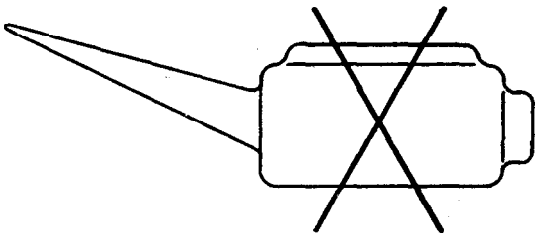
3.2.5 *Regulator Bonnet* — The regulator bonnet shall be provided with sufficiently large relief hole or holes open to atmosphere to prevent any accumulation of pressure inside the cover due to accidental leakage of gas from the inside of the regulator or due to bursting of the diaphragm.

3.2.6 *Relief Valve* — The regulator should be provided with a blow off vent on the outlet pressure side so that in case of any accidental pressure build-up, the gas can be safely vented to the atmosphere.

3.2.7 *Pressure Gauges* — The regulator shall be fitted with a pressure gauge to read outlet pressure with an accuracy of ± 3 percent of maximum scale reading. A pressure gauge of similar accuracy shall also be fitted for the inlet pressure reading unless the manifold is equipped with a suitable pressure gauge.

3.2.7.1 *Marking on pressure gauges* — Oxygen pressure gauges shall be marked with the word:

'OXYGEN — USE NO OIL' or with the word 'OXYGEN' followed by the sketch of a crossed oil can.



Acetylene pressure gauges shall be marked with the word 'ACETYLENE'.

3.2.8 *Pressure Adjusting Device* — The travel of the adjusting screw of all pressure regulators is to be limited so that spring cannot be compressed to its solid height.

4. PRESSURE AND FLOW-NOTATIONS

4.1 Notations used in the standard are as follows:

P_1 — Nominal (maximum) inlet pressure — It is the highest pressure in MPa of the high pressure line (manifold) at a temperature of 15°C.

P_2 — Outlet pressure P_2 — It is the maximum operating pressure in MPa of the outlet pressure of the pipe line to which the regulator is to be fitted.

P_3 — Upstream (critical) test pressure $P_3 = 2P_2 + 0{\cdot}1$ MPa. This is the minimum inlet pressure for the purpose of rating flow performance of the regulator.

P_4 — Stabilized Outlet Pressure — This is the stabilized pressure measured at the outlet of the regulator one minute after cessation of flow where the flow has been set to the standard discharge.

NOTE — The test inlet pressure P_3 and outlet pressure P_2 may be adjusted to give the standard discharge Q_1.

P_5 — The highest or the lowest outlet pressure during a test regulating from a variation of the inlet pressure between P_1 and P_3 at previously adjusted conditions P_1, P_2, Q_1.

Q_1 — Standard discharge (m^3/h) — The minimum flow rate for a regulator outlet pressure P_2.

Q_{max} — Maximum discharge.

The gas flow rate established at the test inlet pressure P_3 and outlet pressure P_2.

R — Coefficient of pressure increase upon closer ($R = \frac{P_4 - P_2}{P_2}$).

i — Irregularity coefficient ($i = \frac{P_5 - P_2}{P_2}$).

5. PERFORMANCE REQUIREMENT

5.1 The manufacturers claim for flow and pressure regulation for the equipment shall be verified by tests.

5.2 The information should be available in a tabular form (*see* Table 1).

6. SPECIAL STIPULATION FOR OUTLET PRESSURE OF ACETYLENE REGULATORS

6.1 The outlet pressure P_2 of acetylene regulator shall be dependent on the diameter of the acetylene outlet pipeline as given in Table 2.

TABLE 1 PERFORMANCE REQUIREMENT FOR REGULATORS PRESSURE AND FLOW CHARACTERISTICS

(*Clause* 5.2)

GAS	NOMINAL INLET PRESSURE (*Max*) P_1	NOMINAL OUTLET PRESSURE (*Max*) P_2	STANDARD DISCHARGE Q_1	MAXIMUM DISCHARGE Q_{Max}	COEFFICIENT OF PRESSURE INCREASE UPON CLOSURE	IRREGULARITY COEFFICIENT
	MPa	MPa	m^3/h	m^3/h	R	i
Oxygen and other compressed gases	20	P_2	Q_1	Q_{Max}	0·5 *Max*	$-0{\cdot}5 \leqslant i \leqslant +0{\cdot}5$
Dissolved acetylene	1.8	P_2	Q_1	Q_{Max}	0·4 *Max*	$-0{\cdot}4 \leqslant i \leqslant +0{\cdot}4$

NOTE — The manufacturer of the regulator shall provide information regarding the outlet pressure P_2, standard discharge Q_1, maximum discharge Q_{Max} for which the regulator is designed. Q_1 should not be less than 0·5 Q_{Max}.

TABLE 2 INTERNAL DIAMETERS OF PIPES AND OUTLET PRESSURE P_2 FOR MANIFOLD ACETYLENE REGULATORS

(*Clause* 6.1)

Internal diameters of pipes (mm)	≤50	60	70	80	90	100	>100 to 150	>150
Outlet pressure P_2 (MPa)	1·5	1·1	0·9	0·8	0·7	0·6	0·3	0·2

NOTE — Intermediate values for internal diameters up to 100 mm may be selected by straight-line interpolation.

7. TEST REQUIREMENTS

7.1 The regulator shall conform to the following test requirements:

a) Initial approval/rating test,

b) Production control test, and

c) Periodic check test.

7.2 Initial Approval/Rating Test — These tests shall be conducted on each type or modified type of regulator.

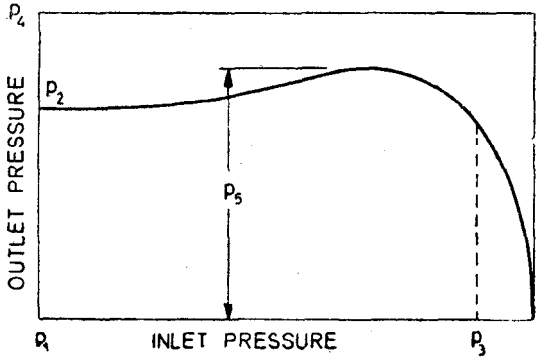
7.2.1 *Maximum Discharge*, Q_{Max} — The discharge Q_{Max} shall be obtained by discharging to atmosphere with the regulator set to the outlet pressure P_2 and the test inlet pressure P_3.

7.2.2 *Standard Discharge*, Q_1 — This will be carried out with a suitable control valve attached to the outlet of the regulator and the test inlet pressure P_3 applied, the outlet pressure shall be raised to P_2 with the outlet control valve closed. The outlet control valve shall then be gradually opened until the standard discharge is attained. If the outlet pressure has deviated, it shall be re-adjusted to the value P_2. The standard discharge under these conditions shall be obtained with the downstream control valve in the fully opened position and with the appropriate corrections for the pressure drop due to the downstream flow measuring equipment to give the corrected discharge to atmosphere.

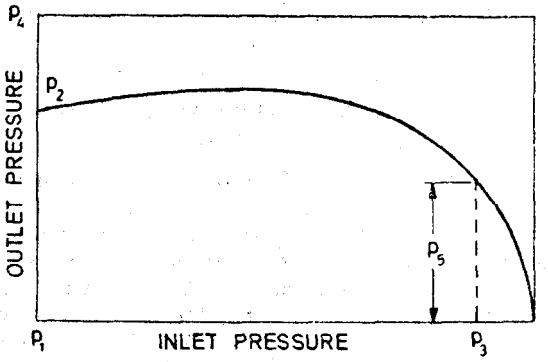
7.2.3 *Stabilised Outlet Pressure*, P_4 — The standard discharge flow rate Q_1 shall be adjusted as stated in **7.2.2.** When a steady state is reached, the gas flow shall suddenly be stopped and after 60 seconds the stabilised pressure shall be observed. This value shall be used to calculate the coefficient of the pressure increase R upon closure.

7.2.4 *Expansion Curve with Rising or Falling Characteristics Plotted During Continuous Discharge* — An expansion curve (*see* Fig. 2) giving the outlet pressure as a function of the inlet pressure shall be plotted during a test

starting with the initial values of P_1, P_2 and Q_1. The test shall last for at least 15 minutes and continue until the inlet pressure comes down to P_3.



2A With Rising Characteristic



2B With Falling Characteristic

FIG. 2 TYPICAL DYNAMIC EXPANSION CURVE

The curve shall show no sudden variation between P_1 and P_3. There shall be no alteration in the outlet pressure setting or the flow control during the test.

From this irregularity coefficient 'i' shall be measured.

NOTE — For the test covered in **7.2.1** to **7.2.4**, oil free air or nitrogen shall be used for the resulting curves and data shall be derived for air at 27°C ± 2°C and 0·1 MPa with the appropriate conversion for the required gas.

7.2.5 *Ignition Safety Test (for oxygen regulator only)* — The regulator heated to 60°C with fully closed pressure regulating valve (for example, pressure adjusting screw loosened) shall be exposed at the inlet to pressure shocks with commercial grade oxygen. The oxygen shall be heated to 60°C ± 3°C at a minimum pressure of P_1.

Each test series shall consist of 20 pressure shocks at 30 seconds intervals, each pressure shock being applied for 10 seconds.

After each pressure shock the test regulator shall be depressurized. The venting of the oxygen shall not be through the regulator but upstream of the inlet connection.

During the test series the inlet pressure shall not decrease by more than 3 percent.

Regulators shall not burn out during this test nor shall the internal components show signs of scorching.

7.2.6 *Mechanical Strength Test (Hydraulic Pressure Test)* — The bodies of regulators shall withstand a pressure of 1·5 times the inlet pressure P_1, but not less than 30 MPa for the inlet passages. For these tests the valve orifices may be blanked and the inlet pressure gauge (if fitted) replaced by a blanking plug. The outlet pressure chamber and the intermediate chambers on two stage regulators shall withstand a pressure of not less than 3 MPa. During this test the diaphragm, relief valve and pressure gauges may be replaced with suitable blanks and the blanking plugs used shall be free from leaks. This test shall be conducted hydraulically.

7.3 Production Control Test — These shall consist of the following to be conducted on each regulator:

a) *Seat Leak Test* — With the pressure adjusting screw fully released and the regulator inlet subjected to a minimum pressure of 7 MPa for oxygen regulator and 1·4 MPa for acetylene regulator, there shall be no leakage of gas from the regulator outlet.

b) *Overall Leak Test* — With the regulator outlet blocked and the regulator inlet subjected to a minimum pressure of 7 MPa for oxygen regulators and 1·4 MPa for acetylene regulators, there shall be no leakage from the regulator including threaded connections, diaphragm clamping surfaces, pressure relief devices or pressure gauges. For this test the regulator should be adjusted to a flow rate of Q_1 at an outlet pressure of P_2.

c) Inlet pressure lower than P_1 is suggested after due consideration of the available experience that leak tightness can be obtained easily at higher inlet pressure when neoprene rubber seat is used but if proper care is not taken, the seat may start leaking when the pressure is lowered.

NOTE — Leak test may be performed with an appropriate leak testing solution such as soap solution applied as a film over the part being tested, continued distention of the film shall be considered as evidence of leakage.

7.4 Periodic Check Tests — These shall comprise of the following to be conducted at least once a year:

a) Seat leak test, *see* **7.3** (a);
b) Overall leak test, *see* **7.3** (b);
c) Maximum discharge; and
d) Standard discharge.

7.4.1 The ignition test shall be included as a periodic check test if there is a change in the material or in the design of the regulator after its initial approval.

8. MARKING

8.1 Each regulator shall show the following markings:

a) The manufacturer's identification,
b) A distinctive catalogue number or equivalent, and
c) The name of the gas for which the regulator is to be used.

8.2 All markings shall be legible and reasonably permanent.

8.2.1 The pressure regulator may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a lince for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Institution.

9. INFORMATION TO BE PROVIDED BY THE MANUFACTURER

9.1 All leaflets and catalogues on the regulators shall provide the performance requirements of the regulator in the tabular form as indicated in Table 1 and **5.1.**

(*Continued from page 2*)

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INDIAN STANDARDS

ON

WELDING EQUIPMENT

IS :

4972-1968	Resistance spot-welding electrodes
6016-1970	Hose connection for welding and cutting equipment
6901-1981	Pressure regulators for gas cylinders used in welding cutting and related processes (*first revision*)
7653-1975	Manual blowpipes for welding and cutting